ASSESSMENT OF PROXIMATE COMPOSITION AND SENSORY QUALITY OF BEETROOT AND CARROT SMOOTHIE

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LETTER OF TRANSMITTAL

Date: 27-07-2021
To
Dr. Sheikh Mahatabuddin
Associate Professor and Head
Department of Nutrition and Food Engineering
Faculty of Allied Health Sciences
Daffodil International University

Subject: Submission of Project Report.

Dear Sir,

With due respect, I would like to express my thankfulness for your advice and encouragement during my study. It would be really hard for me to complete this report without your support. I am also obliged to Daffodil International University and all my teachers and many other respective persons for their guidance during my project work.
I have gathered my best work to achieve the purposes of the report and hope that my effort will serve the commitment. The practical knowledge and experience that I absorbed during the report preparation will greatly help in my future professional life. I am requesting you to excuse me for any oversight that may occur in the report despite my best effort.

If you have any questions regarding my report, I will be glad to answer your question.

Thank you again for your support and patience.

Md. Ohidul Islam
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LETTER OF AUTHORIZATION

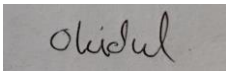
Date: 27-07-2021
The Head of the Department
Department of Nutrition and Food Engineering
Daffodil International University

Subject: Submission of Project Report

Dear Sir,
This is my trustworthy testimony that the "Project Report" I have prepared is not a copy of any thesis report previously made by any other students.

I am also expressing my true authorization to support the fact that the said thesis report has neither been used before to fulfill my other course related nor it will be submitted to any other person or authority in future.

Sincerely Yours



……..
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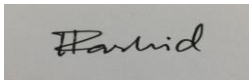
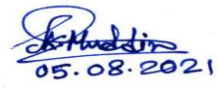
CERTIFICATE APPROVAL

I am delighted to endorse the project report on **"ASSESSMENT OF PROXIMATE COMPOSITION AND SENSORY QUALITY OF BEETROOT AND CARROT SMOOTHIE"** at Daffodil International University conducted by Md. Ohidul Islam, bearing ID: 173-34-703 of Department of Nutrition and Food Engineering has been approved for Defense/Viva voce. Under my supervision Md. Ohidul Islam has worked in the NFE laboratory at Daffodil Smart City, Savar, Dhaka.

Md. Ohidul Islam bears a convincing honesty and a really pleasing identity. It was truly an honor to work with him. I wish him boundless success in life.





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At the very beginning, I would like to express my deepest gratitude to almighty Allah for giving me the potency and calmness to complete the thesis paper.

I am thankful to my parents without whom I cannot be here. Without the care of my parents, I would not be able to complete my objectives and goals.

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I would also like to express my heartfelt obligations to all NFE Faculty members' and officials for their immeasurable motivation and encouragement throughout my student life.

THE PROJECT WORK
IS DEDICATED
TO
MY BELOVED PARENTS

ABSTRACT

Smoothie is a product of blended fruits. It a trendy breakfast items for hot morning. Carrots and beetroots are popular vegetables. They already know as super food for their nutritional properties. The aim of this study was to develop smoothie incorporating carrots and beetroots and evaluates its nutritional and sensory quality. Carrots and beetroots incorporated smoothie has been developed in the NFE laboratory at DSC. From the proximate study it is found that carrot and beetroot smoothie contains around 13gm carbohydrate and good amount of minerals. Smoothie could also be a good hydrating food since it contains 83% moisture. The sense quality of developed smoothie was also promising, 93% participants like the smoothie and the no one dislikes it. So, it could be said that carrot and beetroot smoothie would be a great way of feeding healthy vegetables to new generation.

Key-words: Smoothie, Beetroot, Carrot, Healthy

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Chapter One
Introduction

1. Introduction

1.1 Smoothie

Smoothie is a liquid product obtained from blended vegetables and fruits. A smoothie normally has a liquid base such as water, fruit juice, plant milk, and sometimes-dairy products, such as milk, yogurt, ice cream etc. Smoothies could also be made of other materials, such as crushed ice, sweeteners (honey or sugar), vinegar, whey powder, chocolate etc. by personal choice (Smoothie - Wikipedia Republished // WIKI 2, 2021). The healthiness of a smoothie differs on its ingredients and their proportions. Various smoothies contains large or multiple servings of fruits and vegetables, which are recommended in a healthy diet and proposed to be a meal replacement. Smoothie could be a great way to feed youth and adult the recommended amounts of fruits and vegetables (Guazi, Lago-Vanzela and Conti-Silva, 2018).

1.2 Carrots

Throughout the world carrot *(Daucus carota* L) is one of the popular root vegetables. It is a good source of dietary carotenoids, natural antioxidants. The nutritional compositions of carrots stated by Sharma *et al.*, 2012 are shown in the table 1.

Table 1: Nutritional composition of carrot.

Parameters	Amounts per 100 g
Moisture	86-89
Carbohydrate	10.6
Fiber	1.2
Ash	1.1
Protein	0.9
Fat	0.2
Ca	34 mg
Fe	2.2 mg
P	53 mg
Na	40 mg
K	240 mg
Zn	0.2 mg
Carotenes	5.33 mg
Vitamin C	4 mg

1.3 Beetroot

Beetroot is an annual or biennial taproot crops, which is scientifically known as *Beta vulgaris subsp. Vulgaris conditiv* (Wruss *et al.,* 2015). Beetroot is a good source of various nutrients as shown in table 2 (Baião *et al.,* 2017). Due to its health promotional characteristics beetroot is currently being applied as a functional constituent in the development of various foods (Chhikara et al., 2018 and Domínguez *et al.,* 2018).

Table 2: Nutritional composition of beetroot.

Parameters	Amounts per 100 g
Moisture	74.5
Carbohydrate	22.6
Fiber	0.9
Protein	0.7
Fat	0.16

1.4 Objective of the study

The objective of this study was to develop vegetables based smoothie incorporating carrot and beetroot to promote healthiness.

1.5 Specific Objective of the study

1. To develop carrot and beetroot incorporated smoothie.
2. To analyze the proximate composition of smoothie.
3. To determine the sensory quality of the smoothie.

Chapter Two
Materials & Methods

2. Materials and methods

This study was conducted in the laboratories of the department of Nutrition and Food Engineering at Daffodil Smart City, Savar, Dhaka.

2.1 Materials

2.1.1 Collection of Raw Materials

Fresh carrots and beetroots were collected from the local market.

2.1.2 Preparation of Carrot Beetroot smoothie

Selection of carrot and beetroot

Fresh and mature carrots and beetroots were selected and used during present study.

Pre-treatment

Carrots and beetroots were boiled into boiling water. Boiling stops the enzymatic browning and helps to properly mix into the blender.

Preparation of slice

The selected fresh carrot and beetroot were peeled out and clean with fresh water. Then sliced all the carrot and beetroot into the required size and shape.

2.1.3 Preparation of smoothie

List of Ingredients

1. Carrot =100gm
2. Beetroot =100gm
3. Sugar =10gm
4. Banana =45gm
5. Milk =1 cup
6. Cardamom=1/3 Teaspoon

Figure 1: Ingredients of smoothie

List of the Equipment

1. Electric measuring balance.
2. Blender
3. Beaker
4. Spatula
5. Knife
6. Chopping board
7. Aluminum foil
8. Stove

Process details

Sliced carrots and beetroots were weighted. Ripe banana was peeled and cut in small pieces and weighted.

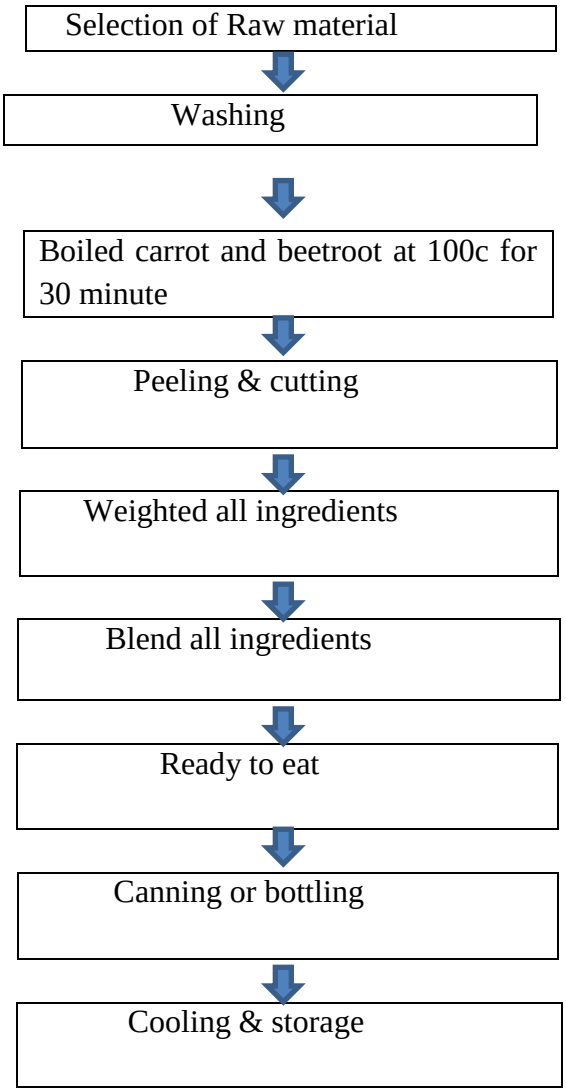

Figure 2: Flow chart of carrot beetroot smoothie

Blending

After weighing all the ingredients, put into a blender and blend for 5 minutes at a high speed to get a smoothie.

Bottling

After blending smoothie placed into pre-sterilized bottle and seal properly.

Storage

The entire sealed bottle is then stored in refrigerator for further analysis.

Figure 3: Carrot beetroot Smoothie

2.2 Methods

2.2.1 Determination of Fat

Apparatus:

1. Crucible lid
2. Weight machine
3. Soxhlet apparatus

Chemical:

1. Petroleum Ether or N-Hexane

Procedure

1. Weight a thimble and boiling flask
2. Then take sample into the thimble
3. Weight the thimble with sample
4. Then place the thimble into the soxhlet apparatus
5. Then set it in the boiling flask
6. Put N-Hexane into the flask
7. Then adjust its thermostat heating set

8. The N-Hexane evaporated by heat to the top of the equipment. Where water cools down to evaporate and stored into the thimble. The n-hexane released fat from the sample and overflowed into the boiling flask. This process continued for 6-8 hours
9. After 6-8 hours fat containing flask are taken out
10. Now flask are place into hot a plate and evaporate the n-hexane
11. Then place the flask into electric oven to remove the remaining n-hexane
12. The put into a desiccator for cooling and then weight

Calculation

Fat%= FW-IW/SW*100

Carrot Beetroot Smoothie:

Fat%= FW-IW/SW*100

Figure 4: Soxhlet Apparatus

2.2.2 Determination of Moisture

Apparatus:

1. Crucible with lid
2. Weight machine
3. Oven
4. Spatula

Procedure

1. At first take the weight of empty crucible with lid (W1)
2. Take sample into the crucible
3. Weight the crucible with sample and determine the sample weight (W2)
4. Place the crucible into an oven at 105 degree Celsius for 1 hour
5. After 1 hour takeout the crucible and put into a desiccator for 30 minute
6. Again weight crucible (W3)

Calculation

Moisture % = W2-W3/SW*100

Figure 5: Electric Muffle furnace

2.2.3 Determination of Ash

Apparatus:

1. Crucible with lid
2. Electric Muffle Furnace
3. Weight machine
4. Spatula

Procedure

1. Weight the empty crucible with lid (W1)
2. Weight the crucible with sample (W2)
3. Now place crucible into the electric muffle furnace at 600 degree Celsius for 6 hour
4. After 6 hours of ignition take out the crucible and put into the desiccator for 30 minute
5. Again weight the crucible (W3)

Calculation

Ash % = W2-W3/SW*100

2.2.4 Determination of Protein

Procedure

Kjeldhal methods consist of 3 steps.

They are as follow:

1. Digestion
2. Distillation
3. Titration

Digestion of sample

0.4g samples were taken in a foil paper or a weighing paper. The sample was poured in a kjeldhal digestion flask. 10ml of H_2SO_4 was added into it. Then 2g digestion mixture was taken into the flask. The flask was heated in a kjeldahl digestion chamber. At first the temperature was 20 degrees and then it rose to 65 degrees centigrade. Around 3-4 hours of heating make the solution colorless. Then the flask was cooled and shifted into a volumetric flask and volume to 100 ml with distilled water.

Figure 6: Digestion of sample in Kjeldhal flask

Distillation

10ml of solution from that flask was taken to the distillation flask. 150ml distilled water was taken into the flask. Then 10ml of 40% NaOH was added to the distillation flask. Solution was colorless. A blank also processes at the same time with only reagent without sample. On the other hand 50ml of distilled water and 10ml of 0.1 M HCL was taken in a trapping conical flask. 2 drops of methyl red was taken into the trapping conical flask. The solution becomes pink after distillation. Then the condenser was run for 30 minute to complete the distillation process. Then the trapping conical flask was removed and titrated with NaOH.

Titration

For titration the burette was filled with 0.1N of NaOH. Then trapping conical flask was set under the burette for titration. From the burette NaOH was added into trapping conical flasks by drop wise and conical flask was shaken gently. NaOH was added until the color changed. The end point was determined by color change from pink to yellow.

Calculation

Percentage of crude protein was calculated by using the following formula

Protein % =(C-B)*14*d*6.25*100/a*1000
Where,
a= Sample weight
b= Volume of NaOH required for titration for sample
c= Volume of NaOH required for titration for blank
d= Normality of NaOH used for titration
6.25 = The conversion factor of nitrogen to protein
14= the atomic weight of nitrogen

2.2.5 Determination of pH

Apparatus:

1. PH meter
2. Beaker

Reagent:

1. Buffer-1: pH: 4
2. Buffer-2: pH: 7

Procedure:

1. At first turn the switch on
2. Then calibrate the pH meter with buffer-1 and buffer-2.
3. Then take sample into a beaker
4. Put the pH meter into the sample containing beaker
5. Take the reading after getting the meter digit fixed

Figure 7: pH meter

2.2.6 Determination of Viscosity

Apparatus:

1. Viscosity meter
2. Beaker

Procedure:

1. At first set the viscosity meter
2. Then viscosity meter rods are put into the sample.
3. Now set the Rotor 1/2/3/4 to depend on our sample.
4. Now click the start button for viscosity measure.

Figure 8: Viscosity meter

2.2.7 Determination of Brix

Apparatus:

1. Brix Meter
2. Tea Spoon

Procedure:

1. First, take the sample into the Brix meter.
2. Then see the color level in meters.
3. Record the reading

Figure 9: Brix meter

2.2.8 Total carbohydrate

A subtract method was used to measure the total carbohydrate. The method was as bellow
% of Total carbohydrate = 100 – (Protein + Fat + Ash + Moisture)

2.2.9 Sensory analysis

The sensory quality of carrots and beetroot smoothies was analyzed through a 9-point hedonic scale planned by Perham and Girardot in 1952.

Chapter Three
Results
&
Discussions

3. Results and Discussions

3.1 Proximate composition of carrot and beetroot smoothie

The proximate compositions of carrot and beetroot smoothie have been shown in the figure10.

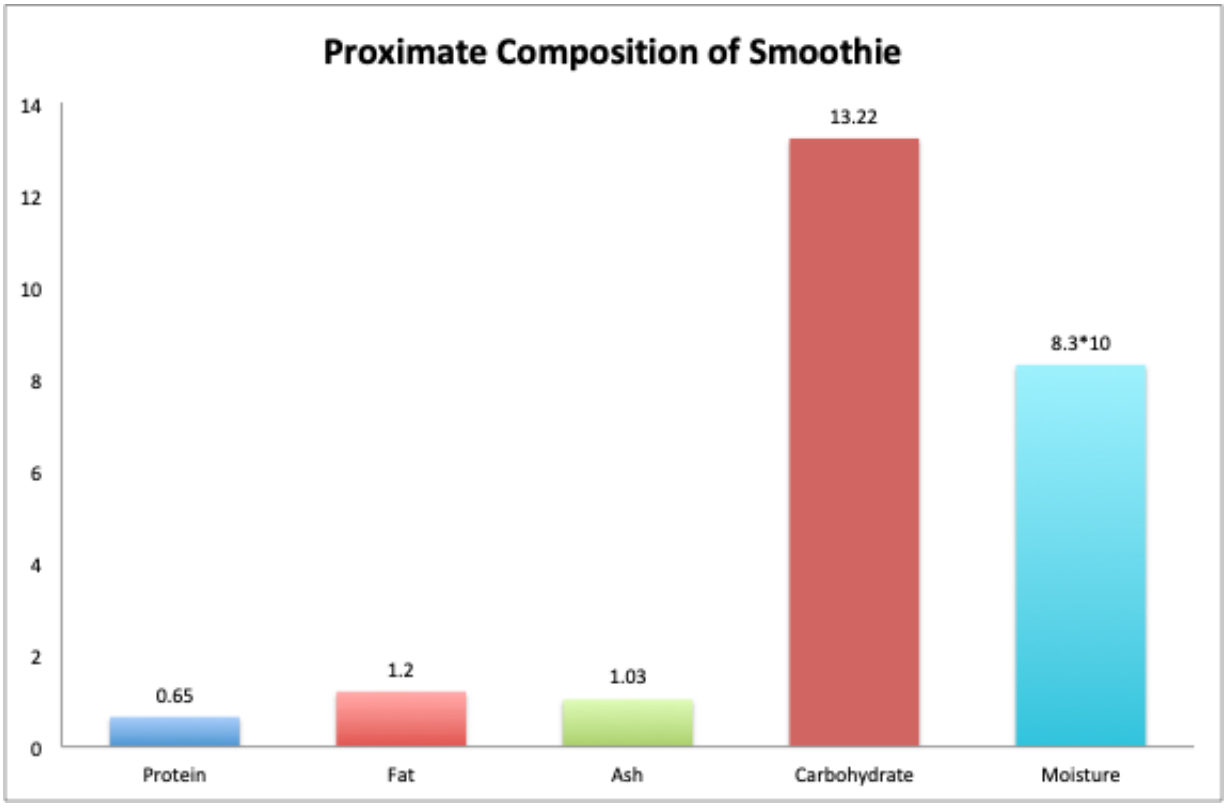

Figure 10: Proximate composition of smoothie.

Among all nutrients the protein content (0.65gm) was lowest where the moisture content was highest (83gm) in the smoothie. The carbohydrate content was 13.22gm and fat content was 1.2gm. The ash content of smoothie was around 1gm.

3.2 Physical and chemical properties of smoothie

The physical and chemical properties of smoothie were also analyzed. The degree brix of the smoothie was 13.5 where the viscosity was 8.5. The pH of the smoothie was 6.4.

Table 3: Physical characteristics of Carrot Beetroot smoothie.

Parameters	Value
Degree Brix	13
Viscosity	8.5
pH	6.4

3.3 Sensory perception

The sensory qualities of carrot and beetroot smoothies were analyzed by a 9 scale hedonic tests among 15 peoples. The sensory panel members have given their comments on color, test, flavor, appearance and overall acceptance of carrot beetroot smoothie. 13% of the participants like the smoothie extremely where 60% of the like the smoothie moderately. Slightly likes the smoothie by 20% participants and 7% of the neither like or dislike. But there was no one who dislikes the smoothie.

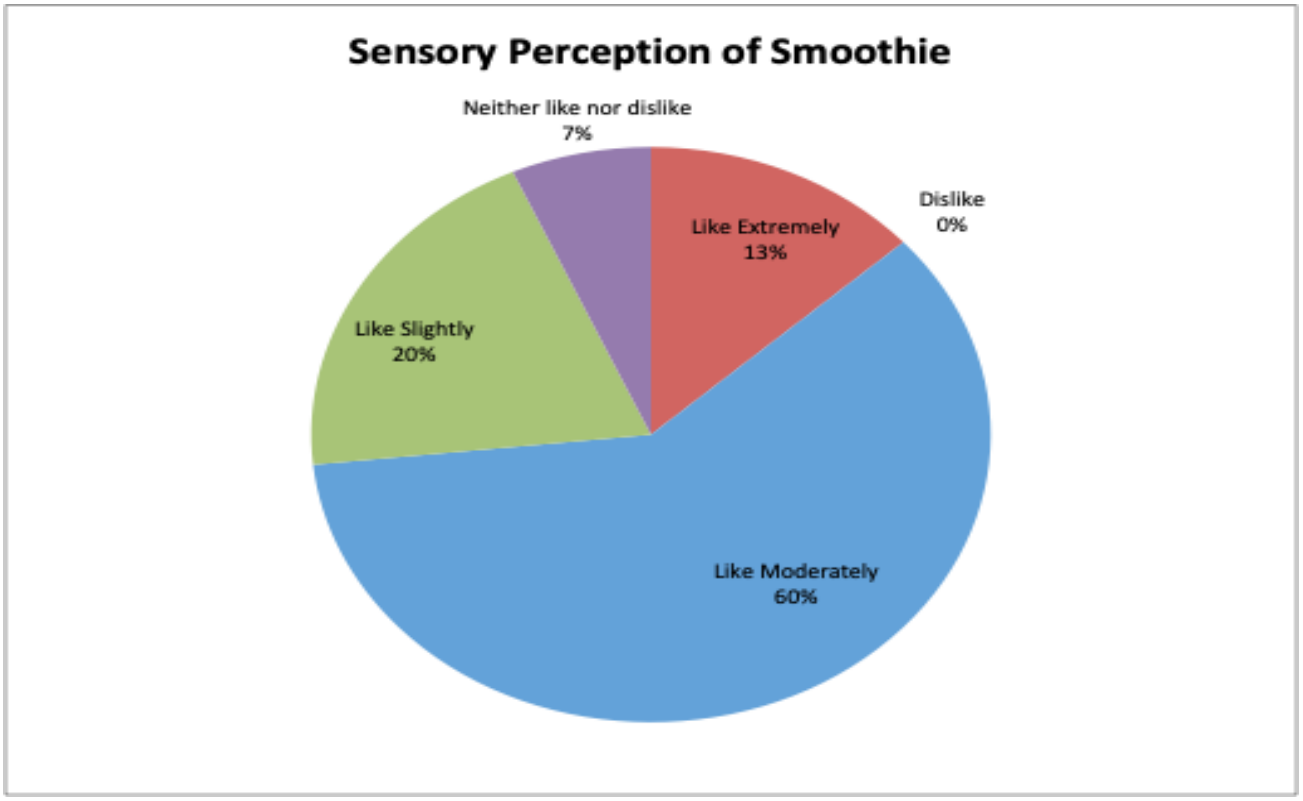

Figure 11: Sensory perception of carrot and beetroot of smoothie.

Chapter Four
Conclusion

4. Conclusion

This study was a first approaches from the department to introduce vegetables based smoothie. From the result of proximate composition and physical properties it is found that carrot and beetroot smoothie can carry their healthiness into smoothie since the smoothie contains around 13gm carbohydrate and good amount of minerals. By containing 83% moisture, smoothie proves that it could also be a good hydrating food. In the sense of taste and sensory perception 93% participants like the smoothie and the no one dislikes it. So, it could be said that carrot and beetroot smoothie would be a great way of feeding healthy vegetables to new generation.

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